

REMARKS

Election/Restriction

The Applicant affirms the election of Group I, claims 1 – 11, without traverse.
Claims 12 – 30 have been cancelled as being drawn to a non-elected invention.

Claim Rejections - 35 U.S.C. § 112

The Examiner has rejected claims 3, 5, 7 and 9 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim Rejections - 35 U.S.C. § 103

The Examiner has rejected claims 1-11 under 35 USC 103(a) as unpatentable over Reid et al. (U.S. Patent No. 2001/0015321) in combination with Lowenhein (Electroplating McGraw-Hill Book Company, New York: 1978, p. 201-202). The Examiner has rejected claims 10 and 11 under 35 USC 103(a) as unpatentable over Reid et al. (U.S. Patent No. 2001/0015321) in combination with Lowenhein (Electroplating McGraw-Hill Book Company, New York: 1978, p. 201-202) and further in combination with Barstad et al. (U.S. 2001/0047943). The Applicant respectfully traverses. The cited references, either individually or in combination fail to teach all of the elements of the claimed invention. In particular, the cited references fail to teach the element of independent claim 1 of “*determining a concentration of a chloride for the high-acid electroplating solution such that the chloride concentration is sufficient to catalyze the suppressor and to provide gap fill of features having an aspect ratio of 8 or more.*” Reid, Lowenhein, and Barstad all fail to teach that the chloride concentration is related to providing gap fill of substrate features having an aspect ratio of 8 or more. The Examiner stated on page 6 of the Office Action that Barstad teaches a solution for electroplating copper with an increased concentration of brightener

(accelerator) and that the increased concentration allows for better filling of small aspect ratio vias (paragraph 48.) The Examiner then states that Lowenheim teaches that chloride is necessary to active organic additives in copper baths such as brighteners (pg. 202) and that because Barstad teaches that the concentration of brightener can vary depending on substrate features, it follows that the concentration of chloride would also vary depending on the substrate features, since chloride is necessary to activate the brightener as taught by Lowenheim. The Applicant respectfully submits that Lowenheim does not teach that the amount of chloride would increase with an increase in the amount of organic additives (such as a brightener/accelerator). In contrast, Lowenheim merely states that “[f]or proper action of these additives, the baths must contain minor amounts of chloride ion.” Also, Barstad and Reid fail to teach that the amount of chloride in an electroplating solution is increased in relation to an increase in the amount of brightener/accelerator. Therefore, it would not be obvious to vary the concentration of chloride depending on the aspect ratio of substrate features because there is no teaching in any of the cited references that the amount of chloride is dependent upon the amount of brightener/accelerator. As such, the Applicant respectfully submits that independent claim 1, and the claims that depend on and incorporate the limitations of claim 1, are not taught or rendered obvious by the cited references, either individually or in combination.